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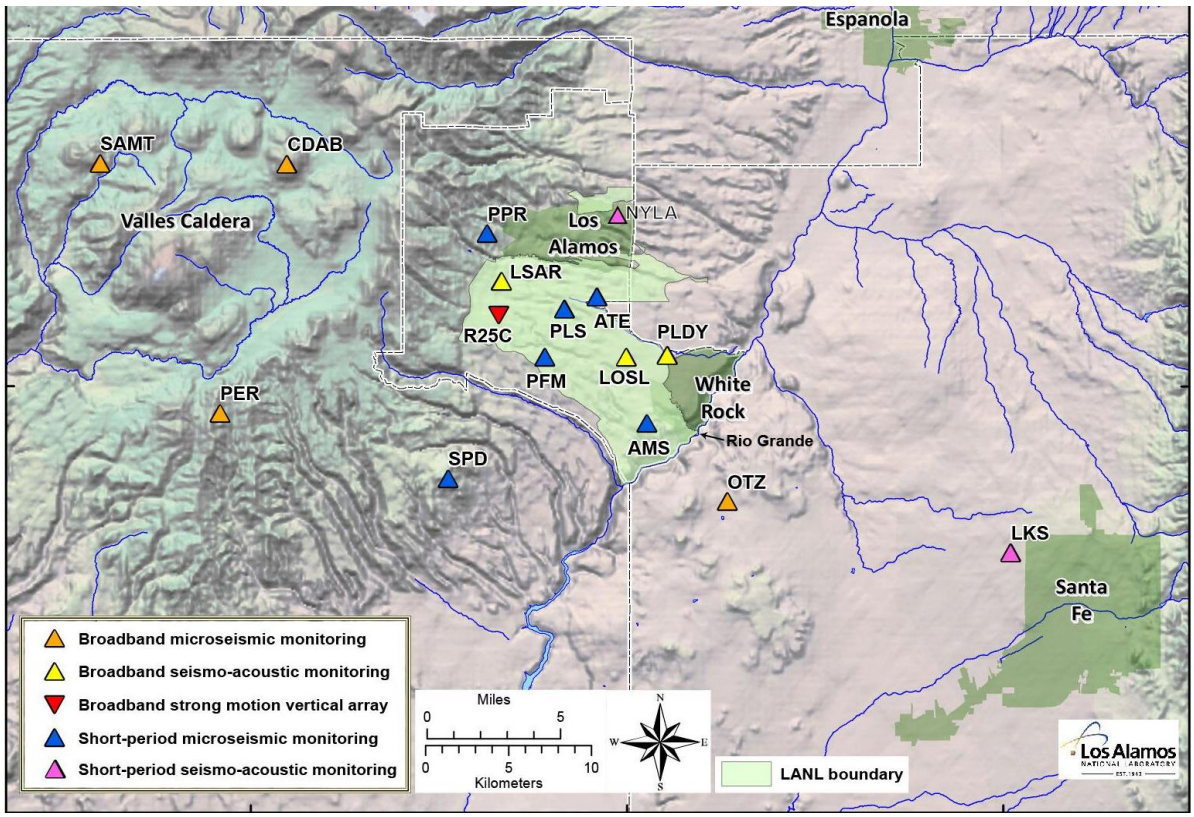
SOMETHIN'S RUMBLIN'

By Terry McDermott

Scientists estimate the last major eruption at the Valles Caldera occurred between 40-50 thousand years ago and it may be that long or longer before the caldera blows its top again. But did you know there have been three earthquakes on the Preserve since then, including two on March 20, 2013? There may have been thousands more but we know about these three because the Preserve is now part of the Los Alamos Seismic Network (LASN).

Established in 1973, LASN is used to monitor and locate earthquakes near Los Alamos National Laboratory (LANL). The network supports the LANL Seismic Hazards Program and features the only seismic monitoring stations in New Mexico north of Albuquerque.

Los Alamos Seismic Network (LASN) Permanent Stations

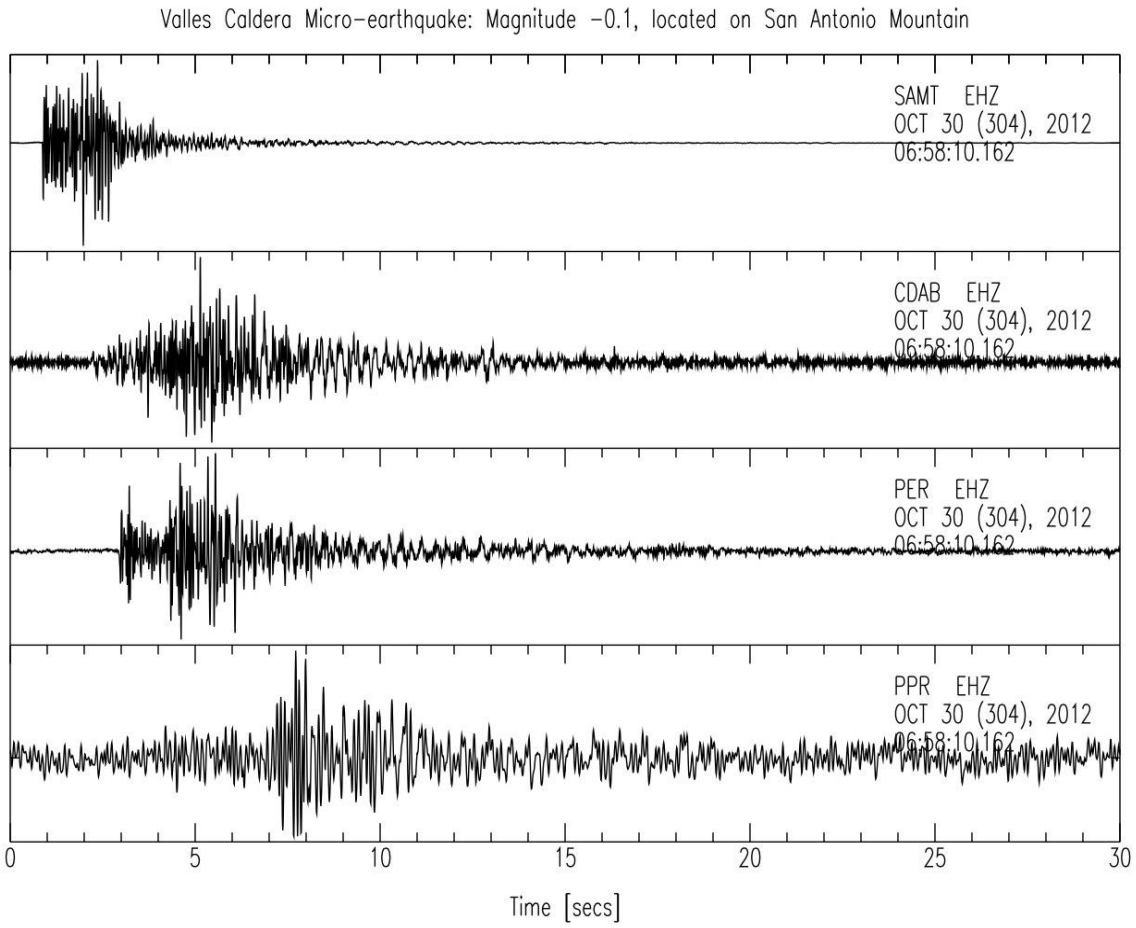


Stations on the Preserve are SAMT (San Antonio Mountain) and CADB (Cerros del Abrigo)

“We typically record and locate 1 to 3 local earthquakes per month within about 150 km of Los Alamos,” says Peter Roberts, LASN Operator. “That's roughly 900 earthquakes total since 1973. The vast majority of those are magnitude 1.5 or smaller and go unnoticed. ”

Roberts began working with LASN in 2000 when the network consisted of seven stations. Since then the network has more than doubled and includes new stations on Cerros del Abrigo (CDAB) and San Antonio Mountain (SAMT) on the Preserve. Since these two stations were installed in 2011-12, three tiny earthquakes have been detected inside the caldera.

The figure below displays seismic signals for the largest of the three Preserve earthquakes, which originated on San Antonio Mountain (SAMT). Signals represent vertical motion of the ground at four LASN stations as the earthquake passes by.



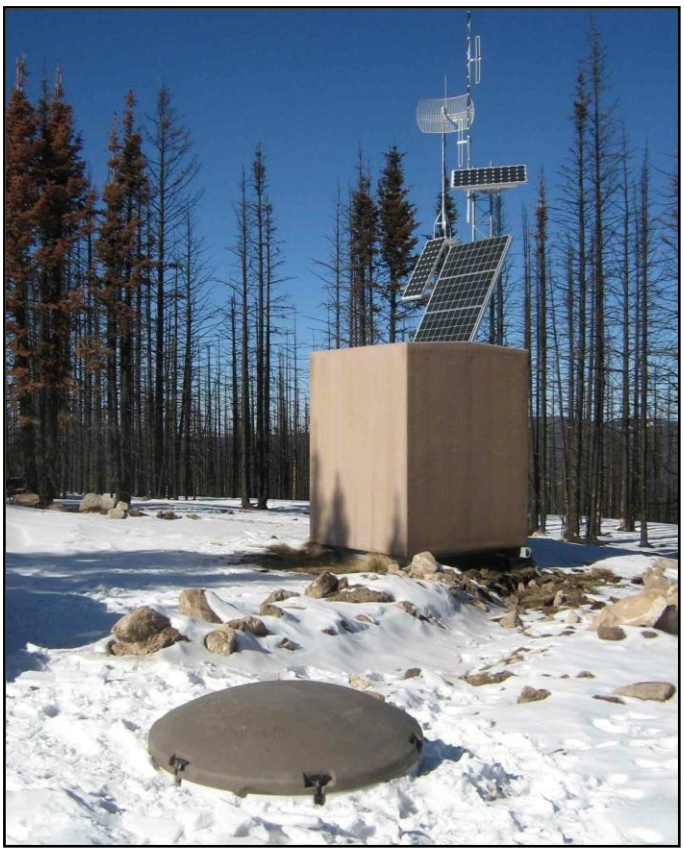
The smallest earthquake that can be felt by a person typically has a magnitude of about 2.5, which is roughly 1000 times larger than the San Antonio Mountain quake shown above. Micro-earthquakes that went unnoticed years ago are now ‘noticed’ because of the expanded LASN station coverage and the higher sensitivity of the new instrumentation being used. However, many other micro-rumbles are also noticed.

"About 99% of what we record are things like wind, animals and thunder storms," says Roberts. "For example, I have learned that a herd of elk goes up Abrigo early every morning and stomps around the station for a while."

Classified as background noise, Roberts and LANL colleague James Ten Cate sift through the chaff to find that sharp, sudden movement. They then compare it with other stations to see if they simultaneously recorded a similar movement which could signal an earthquake has taken place.

Since 1973, the network has recorded eight earthquakes large enough to be felt in Los Alamos. The largest of these was a magnitude 3.0 near Cuyumungue, NM in 2011. The network also picks up rumblings from other parts of the world.

"The waves from large earthquakes can travel around the world at least five or six times," notes Roberts. "We recorded four or five passes from the Japan earthquake in 2011." The Tohoku, Japan earthquake of 2011 registered 9. O with five aftershocks of 7.0 or greater.



Elk like to "drum" on top of the 5-foot-deep barrel (foreground) that houses the seismic instrumentation at the Cerros del Abrigo station (CDAB).

Roberts says a quake of that magnitude is unlikely to occur in the caldera, partly because of the large residual magma chamber that sits three miles below the surface.

"Earthquakes occur when zones of brittle rock rupture suddenly along faults," explains Roberts. "It may be that the residual magma below the caldera keeps the earth above warm enough to prevent brittle rupture from occurring on larger faults in the Preserve. These three tiny earthquakes are the first we have seen in that part of the caldera. It's remarkably quiet in there."

That may be true *now*. But just wait another 40 or 50 thousand years.